64th Congress, 1st Session. | HOUSE OF REPRESENTATIVES. | Document No. 539.

# CONDITION OF AQUEDUCT BRIDGE. WASHINGTON, D. C.

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# LETTER

FROM

# THE SECRETARY OF WAR,

TRANSMITTING

## REPORT OF THE ENGINEER DEPARTMENT ON CONDITION OF THE AQUEDUCT BRIDGE, WASHINGTON, D. C.

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January 11, 1916.—Referred to the Committee on Appropriations and ordered to be printed, with illustrations.

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War Department,
*Washington, December 22, 1915.*

To the Speaker of the House of Representatives.

Sir: Referring to statements found at page 1651 of the Annual Report of the Chief of Engineers, 1915, concerning the necessity of replacing the Aqueduct Bridge, Potomac River, D. C., by a wider and stronger structure, and referring also to estimate submitted by the Commissioners of the District of Columbia "For surveys and plans for bridge to take the place of the existing bridge across Potomac River known as the Aqueduct Bridge" (Estimates of Appropriations, 1917, p. 1088), I have the honor to invite attention to the following report by Lieut. Col. C. A. F. Flagler, Corps of Engineers, the District Engineer Officer in charge of the repairs to the piers of the bridge, showing the critical condition of the structure:

War Department, United States Engineer Office,
Room 305 Southern Building,
*Washington, D. C., December 3, 1915.*

From: The District Engineer Officer, Washington, D. C.
To: The Chief of Engineers, United States Army
(Through the Division Engineer, Eastern Division).
Subject: Dangerous condition of Aqueduct Bridge, Washington, D. C.

1. As a result of inspections made in connection with the annual repairs to the piers of the Aqueduct Bridge across the Potomac River at Washington, D. C., I am compelled to report that I do not consider the bridge safe for the traffic now using it, and I do not believe, without a radical change in the methods employed for the maintenance of the bridge, that it will long be safe for traffic of any kind.

2. I therefore urge that recommendations be made to the Commissioners of the District of Columbia that the traffic regulations for the bridge be immediately modified as follows:

(*a*) That not more than one street railway car be allowed upon the bridge at one time.

(*b*) That the maximum weight of wheeled vehicles permitted on the bridge be 3 tons for animal-drawn vehicles (exclusive of the animals) and 4 tons for motor vehicles.

(*c*) That police supervision be had to prevent excessive overloading of the bridge by traffic at any time.

(*d*) That during periods of heavy ice movement in the river, all traffic over the bridge be suspended.

3. I further urge that the condition of the piers, as described below, be brought to the attention of Congress with a recommendation that funds be provided as soon as practicable, either for the reconstruction of all old piers (3 are new) in the existing bridge, or for the construction of a new bridge to replace the present one.

4. The substructure of this bridge was built in 1835 to 1840 under the direction of Maj. Wm. Turnbull, Corps of Topographical Engineers, United States Army. It consists of 2 abutments and 8 piers, numbered 1 to 8, inclusive, beginning at the Virginia shore. Nos. 3 and 6 are heavier piers than the others and were designated abutment piers at the time of construction. In 1889 a heavy freshet caused a movement of several inches in pier No. 1, and injuries to other piers. Since that year examinations have been made, generally annually, and repairs executed to maintain these piers. The piers as originally constructed were of rough rubble masonry laid in hydraulic cement, except the upstream faces which were formed of cut stone to constitute ice breakers. The examinations have shown a gradual deterioration of the piers below the water line. The defects appear in the form of cavities caused by the dropping out during freshets of one or more of the stones in or near the face; also by the scouring out of the riprap under the edges of the foundations, and the washing out of mortar between the joints. The method of repair has been to employ a diver to fill the cavities with concrete in bags, fill open joints where large enough to insert a bag, and occasionally to build against the faces, where in exceptionally poor condition, walls of bags to protect against the action of ice. Riprap has occasionally been placed for the same purpose.

5. These makeshift repairs were not sufficient to insure the safety of the piers, and between 1897 and 1907 three of the piers (Nos. 1, 4 and 5) were torn down and new piers constructed. The old methods of repair with a diver have continued on the remaining five piers to the present day. The magnitude of the repairs required annually is shown in the annual reports of the Chief of Engineers. In 1913 the District officer reported as follows:

| Extent of cavities filled in 1912: | Cubic feet. |
|---|---|
| South abutment | 88 |
| Pier No. 2 | 118 |
| Pier No. 3 | 208 |
| Pier No. 6 | 524 |
| Pier No. 7 | 463 |
| Pier No. 8 | 340 |
| Total | 1, 741 |

He stated further: "It was evident in 1910 and still more evident now that the present method of repair can not keep on indefinitely; that sooner or later either serious injury to the old piers will occur, necessitating the stoppage of traffic over the bridge, or perhaps its entire failure will occur."

6. In the spring of 1914 the piers were again repaired, and the number and size of the cavities as reported by the district officer "were almost as great as those found and repaired in November, 1912, and were more than double the amount of those found and filled during the repairs of 1910 and 1911." He states further: "The five old piers should either be rebuilt or the bridge should be entirely replaced by a wider and stronger structure, adequate to accommodate the increasing traffic."

7. The period of examination and repair for the present year was from November 8 to November 30, 1915. The methods followed were the same as those of previous years, which are all that is possible without coffering the piers and removing the water. The amount of concrete placed in sacks was as follows:

| | Cubic feet. |
|---|---|
| Pier No. 2 | 266 |
| Pier No. 3 | 112 |
| Pier No. 6 | 238 |
| Pier No. 7 | 266 |
| Pier No. 8 | 56 |
| Total | 938 |

Blue prints herewith show the location, extent, and nature of the defects found. The defects noted are practically all new, not having been apparent at the examination of last year. The repair work placed a year ago was found generally in good condition, the only exception noted being at pier No. 2, where a concrete projection jacket had been undercut by current scour, at one place nearly 3 feet. The defects reported this year are areas of face with open joints which can be penetrated with a steel rod as much as 4 feet; large cavities, with loose rock fallen from the filling of the piers, which appears to have little coherence, and scour under the edges of the masonry. In pier No. 2 the diver reports indication of vibration producing what he calls a "grinding" effect on the masonry with exudation along the joints of a gray ooze, caused by the working out of the mortar.

8. I have directed the installation of metal plugs in the upstream and downstream ends of the copings of the piers, for instrumental observation of any settling or other movement of the piers.

9. I consider the situation as one demanding serious and immediate consideration. I believe that the reduction of traffic recommended, with a careful observance of movement in the piers, will render the bridge reasonably safe until next spring, but still not devoid of danger.

10. Various sites for new bridges have been suggested * * *. The sites are (a) just above the present site, (b) foot of Thirty-fourth Street, (c) foot of H Street, (d) the Arlington Memorial Bridge from Potomac Park near the Lincoln Memorial. The last is not well located to serve the traffic now using the Aqueduct Bridge; any of the others would probably be entirely satisfactory. If rebuilding of the old piers in the present bridge is to be undertaken, the work can be done without entire stoppage of traffic.

11. The present superstructure of the Aqueduct Bridge is a rather light iron truss which was erected in 1888. The vibration under heavy loads on the bridge appears to me excessive, but the superstructure is not under charge of this office, and I have therefore had no examination made of it.

C. A. F. FLAGLER,
*Lieutenant Colonel, Corps of Engineers.*

[First indorsement.]

OFFICE OF DIVISION ENGINEER,
EASTERN DIVISION, ARMY BUILDING,
*New York City, December 4, 1915.*

To the Chief of Engineers, concurring in the views and recommendations of the district engineer officer.

W. M. BLACK,
*Colonel, Corps of Engineers.*

The Chief of Engineers concurs in the view that the situation is one demanding serious and immediate consideration and thinks that early action authorizing surveys and plans for the construction of a new bridge is highly desirable. On account of the important traffic and navigation interests involved, he also thinks that the department should be left free, in any appropriation which may be made for the purpose, to assign the surveys and the recommendation as to the site within such limits as Congress may fix, and also the preparation of plans, to a board of engineer officers. I concur in his views.

Very respectfully,

LINDLEY M. GARRISON,
*Secretary of War.*

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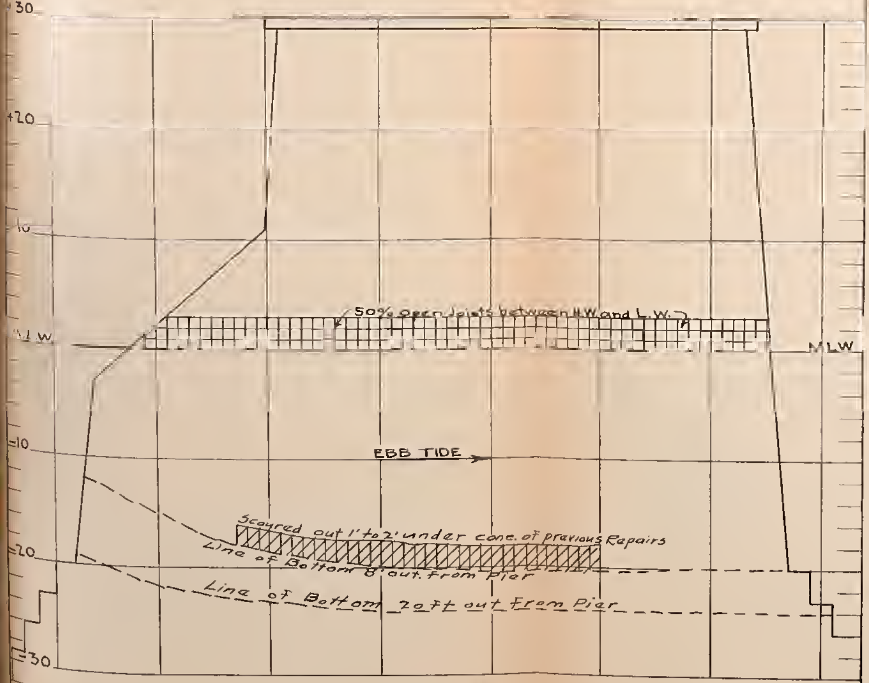
Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.


+30
+20
+10
M.L.W.
-10
-20
-30
50% Open Joints between H.W. and L.W.
MLW
EBB TIDE
Scoured out 1' to 2' under cone. of previous Repairs
Line of Bottom 8' out. from Pier
Line of Bottom 20 ft out from Pier

Pier No 2 - South Side

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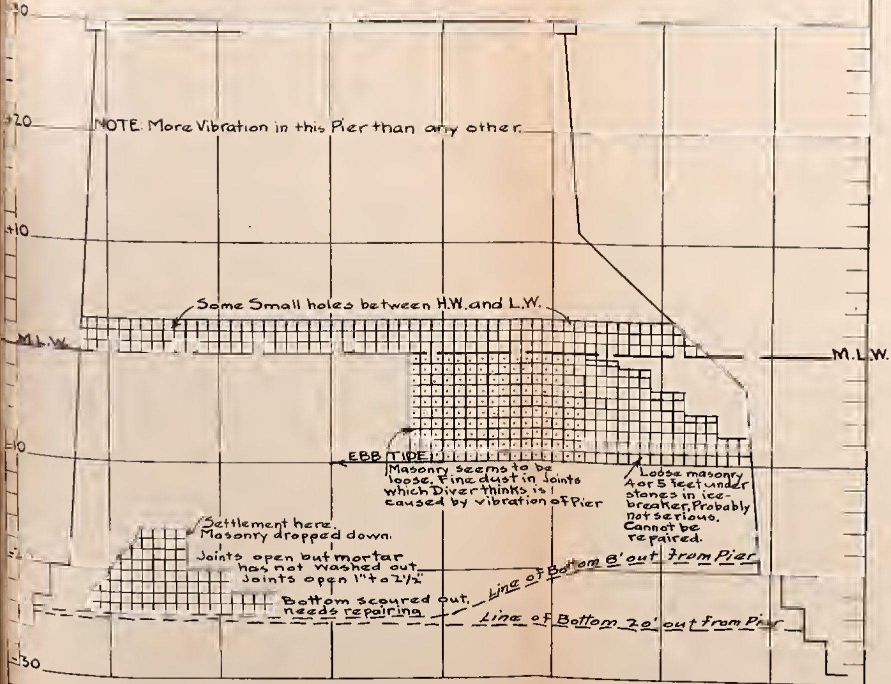
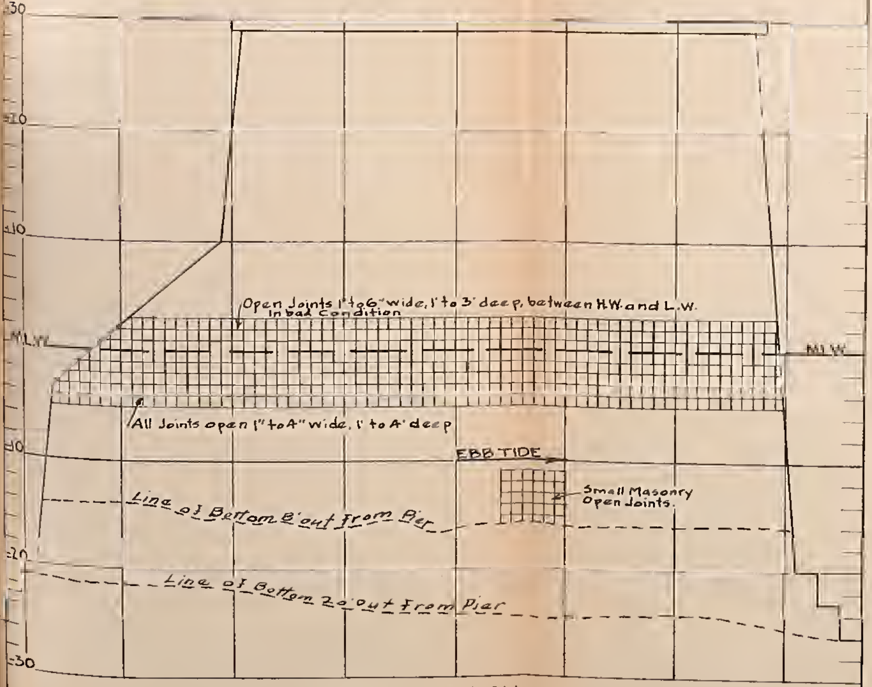
Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.


+30
+20
+10
0
-10
-20
-30
NOTE: More Vibration in this Pier than any other.
Some Small holes between H.W. and L.W.
M.L.W.
M.L.W.
EBB TIDE
Masonry seems to be loose. Fine dust in Joints which Diver thinks is caused by vibration of Pier
Loose masonry 4 or 5 feet under stones in ice-breaker. Probably not serious. Cannot be repaired.
Settlement here. Masonry dropped down.
Joints open but mortar has not washed out.
Joints open 1" to 2½"
Bottom scoured out, needs repairing
Line of Bottom 8' out from Pier
Line of Bottom 20' out from Pier

Pier No. 2 - North Side

Aqueduct Bridge,
Washington, D.C.
Condition November 1915.


30
20
10
M.L.W.
M.L.W.
10
-20
-30
Open Joints 1" to 6" wide, 1' to 3' deep, between H.W. and L.W. in bad Condition
All Joints open 1" to 4" wide, 1' to 4' deep
EBB TIDE
Small Masonry Open Joints.
Line of Bottom 8' out from Pier
Line of Bottom 20' out from Pier

Pier No. 3 - South Side

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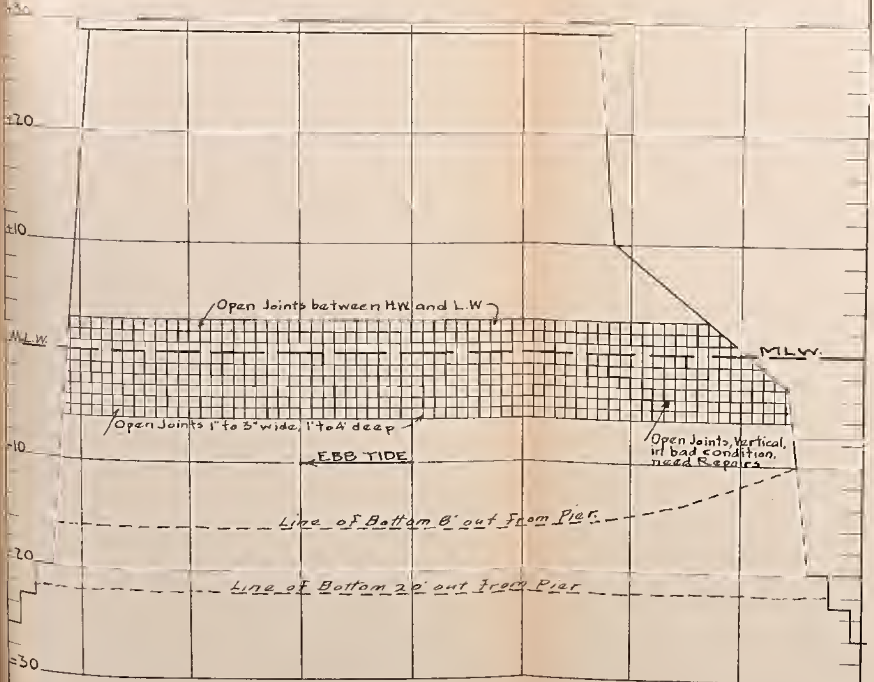
Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.


+30
+20
±10
M.L.W.
-10
-20
-30
Open Joints between H.W. and L.W.
M.L.W.
Open Joints 1" to 3" wide, 1' to 4' deep
Open Joints, Vertical, in bad condition, need Repairs
EBB TIDE
Line of Bottom 8' out from Pier.
Line of Bottom 20' out from Pier

Pier No. 3 - North Side

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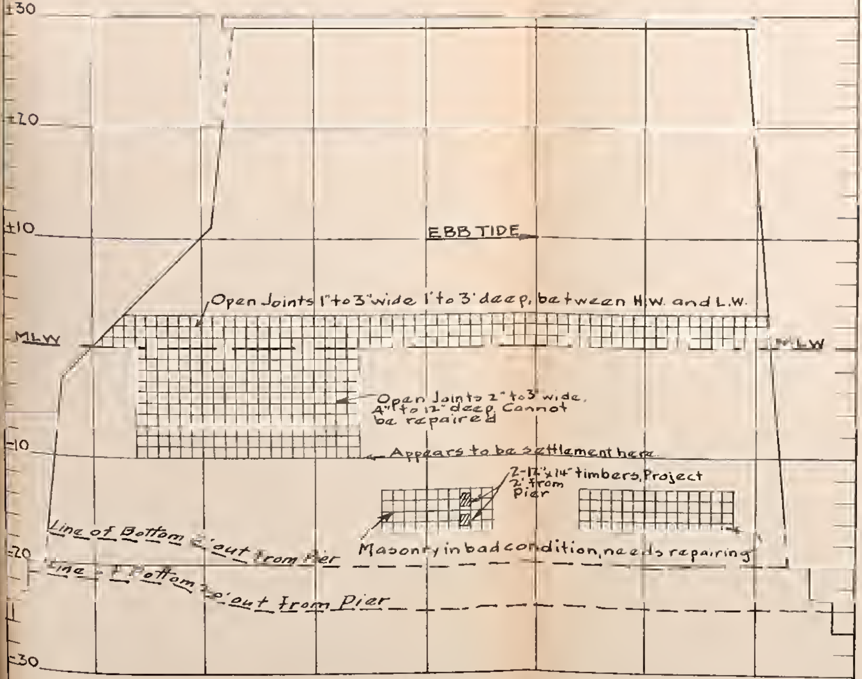
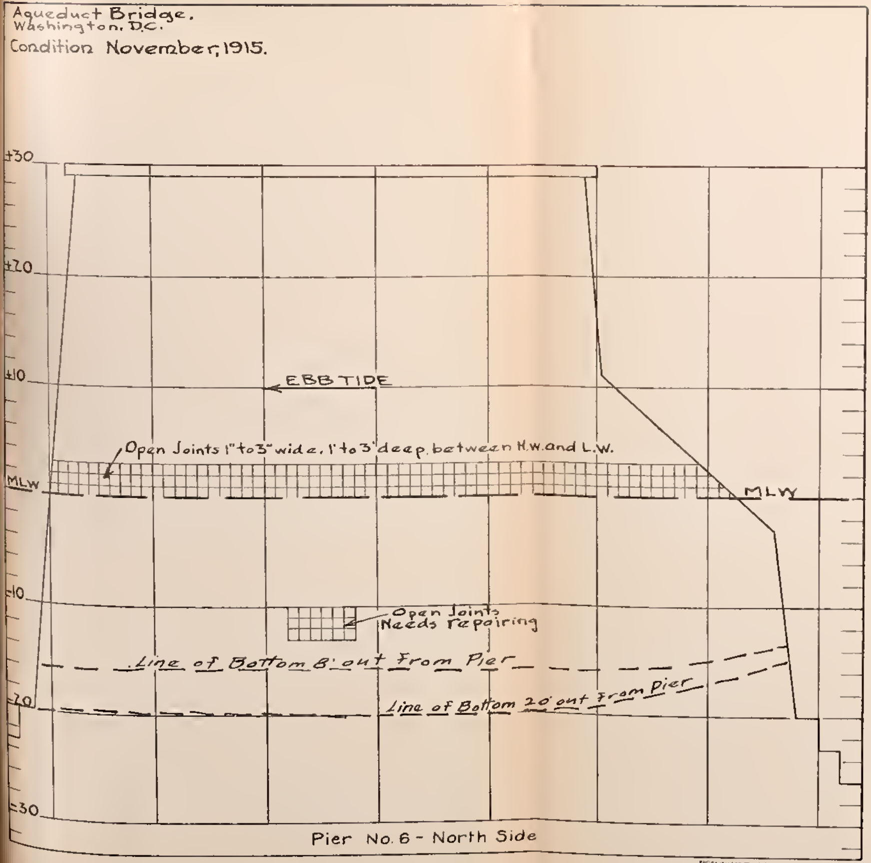
Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.


±30
±20
±10
EBB TIDE
Open Joints 1" to 3" wide 1' to 3' deep, between H.W. and L.W.
MLW
MLW
Open Joints 2" to 3" wide, 4" to 12" deep, Cannot be repaired
-10
Appears to be settlement here
2-12"x14" timbers, Project 2' from Pier
Line of Bottom 2' out from Pier
Masonry in bad condition, needs repairing
-20
Line of Bottom 20' out from Pier
-30

Pier No 6 - South Side


Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.
+30
+20
+10
EBB TIDE
Open Joints 1" to 3" wide, 1' to 3' deep, between H.W. and L.W.
MLW
MLW
-10
Open Joints
Needs repairing
Line of Bottom 8' out From Pier
Line of Bottom 20' out From Pier
-20
-30
Pier No. 6 - North Side

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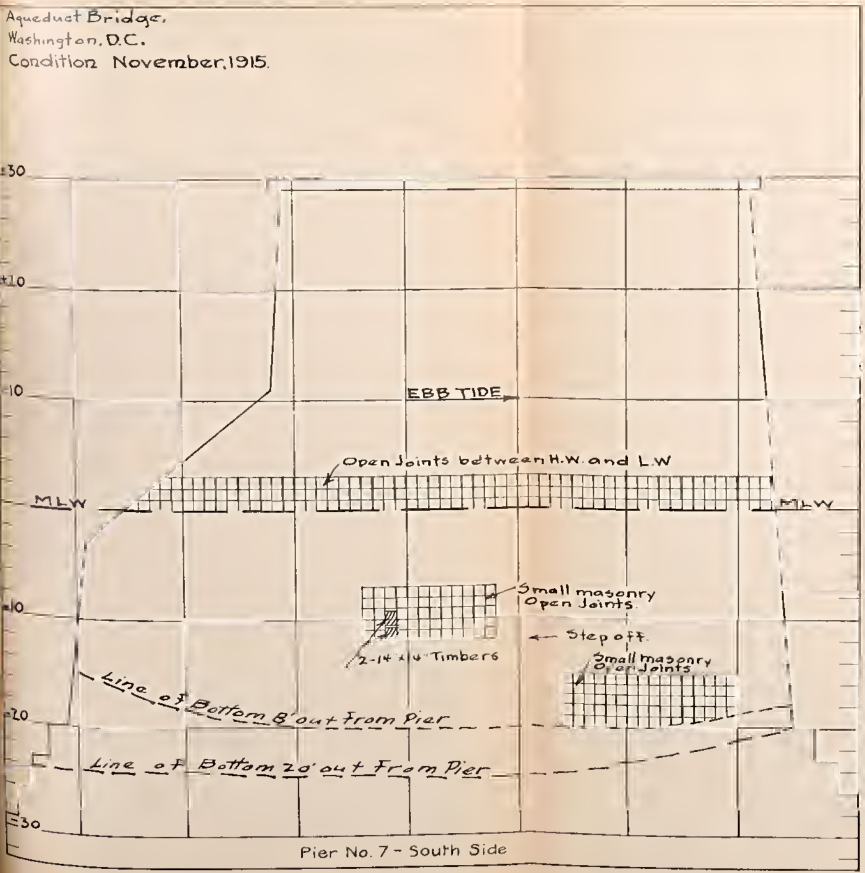
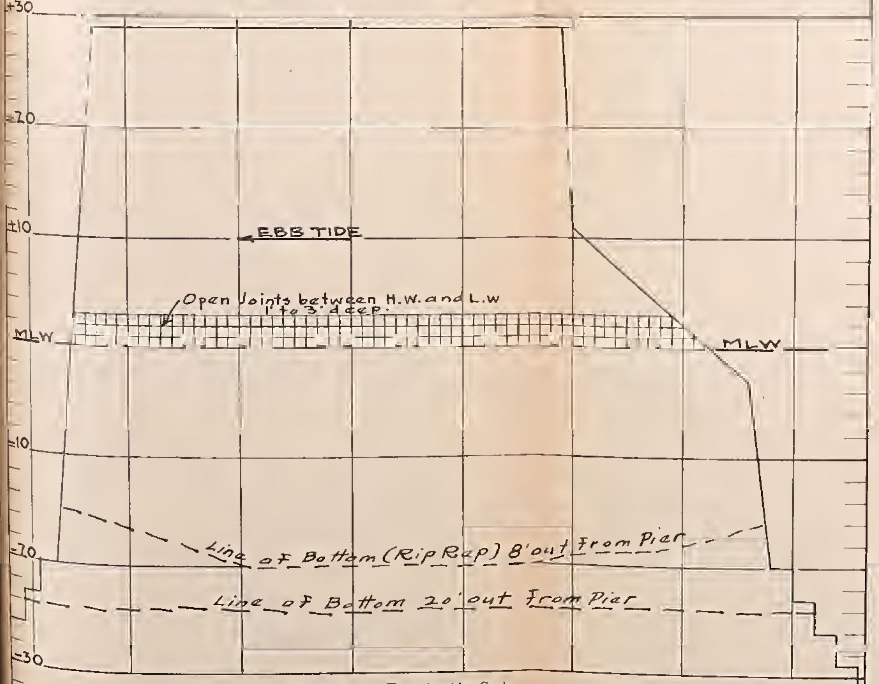


Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.

30
+10
10
MLW
-10
-20
-30
EBB TIDE
Open Joints between H.W. and L.W
MLW
Small masonry Open Joints.
Step off.
2-14"x14" Timbers
Small masonry Open Joints
Line of Bottom 8' out From Pier
Line of Bottom 20' out From Pier

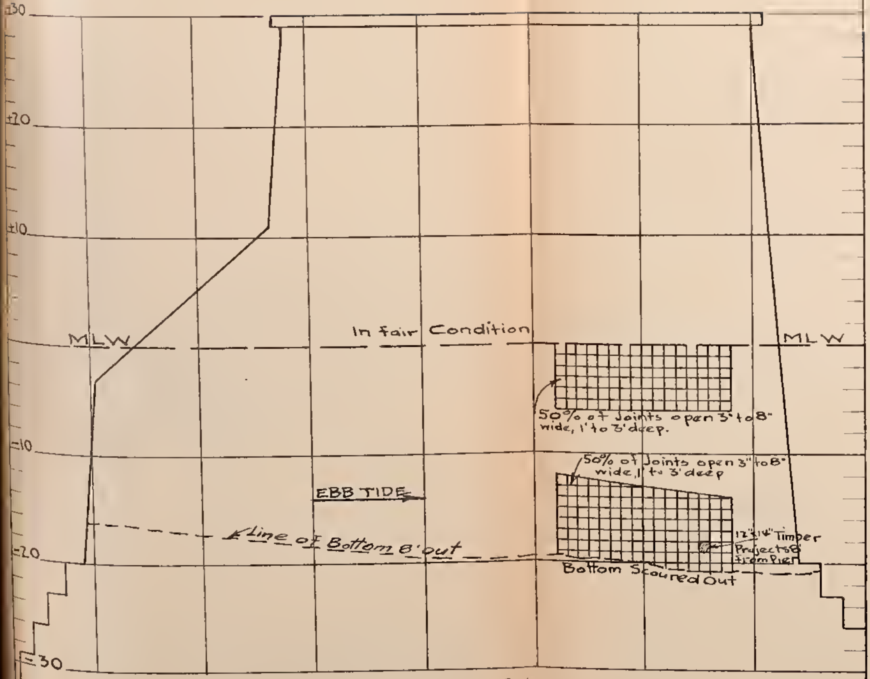
Pier No. 7 - South Side

Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.

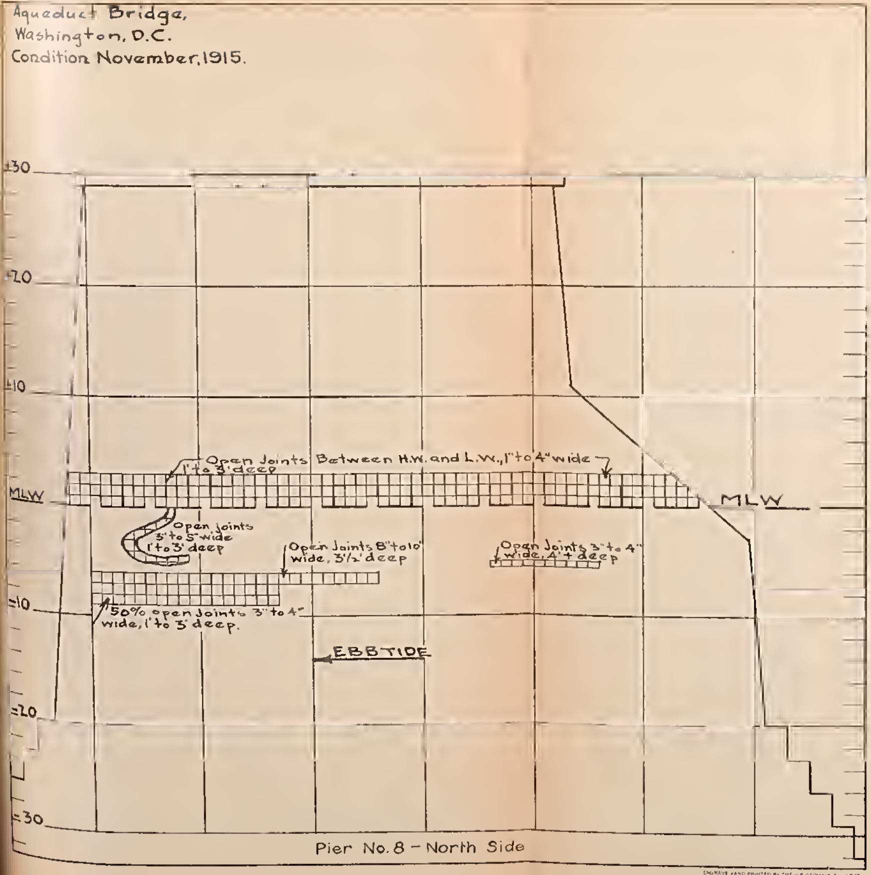

+30
+20
+10
EBB TIDE
Open Joints between H.W. and L.W
1' to 3' deep.
MLW
MLW
-10
Line of Bottom (Rip Rap) 8' out from Pier
-20
Line of Bottom 20' out from Pier
-30

Pier No. 7 – North Side

Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.


+30
+20
+10
MLW
In fair Condition
MLW
50% of Joints open 3" to 8" wide, 1' to 3' deep.
-10
50% of Joints open 3" to 8" wide, 1' to 3' deep
EBB TIDE
Line of Bottom 8' out
12"x14" Timber Projects 8' from Pier
-20
Bottom Scoured Out
-30

Pier No. 8 — South Side



Aqueduct Bridge,
Washington, D.C.
Condition November, 1915.

Pier No. 8 - North Side

+30
+20
+10
MLW
-10
-20
-30
MLW
Open Joints Between H.W. and L.W., 1" to 4" wide 1' to 3' deep
Open joints 3" to 5" wide 1' to 3' deep
Open Joints 8" to 10" wide, 3½' deep
Open Joints 3" to 4" wide, 4' + deep
50% open Joints 3" to 4" wide, 1' to 3' deep.
EBBTIDE

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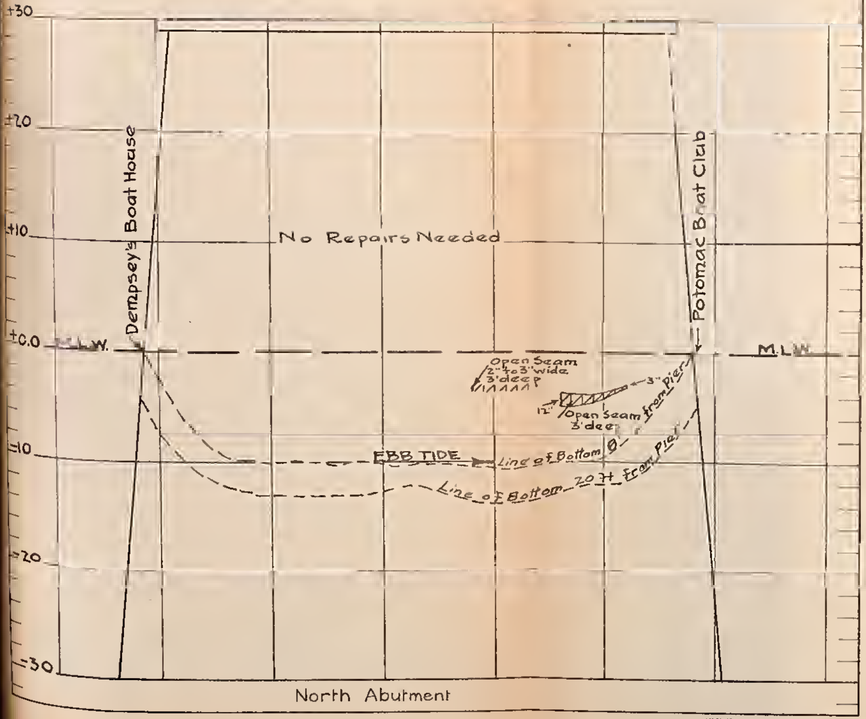
Condition, November, 1915.



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